Evaluation of Potentiometric Surface and Tidal Influence on Slurry Wall Beneath Ventron/Velsicol Site, Woodridge, New Jersey

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Introduction

The intention of this technical memorandum is to evaluate potential hydraulic effects of a slurry wall and impermeable cap installed in the subsurface around the location of the former Wolf Warehouse at the Ventron/Velsicol Site (the Site) in Woodridge, New Jersey. This evaluation involves mathematical modeling of several existing and potential hydraulic conditions at the Site.

As planned for one of the evaluated remedial alternatives (Groundwater Alternative G4), a slurry wall would surround the Wolf Warehouse (Figure 1) with the base of the wall keyed into a clay unit approximately 20 feet below grade (Figure 2). The clay unit is relatively massive extending from 20 feet below grade to the top of bedrock at greater than 100 feet below grade. The slurry wall would isolate contaminated water surrounding the Wolf Warehouse from the remainder of the shallow water bearing zone. To preclude the infiltration of water into the encapsulated area, an impermeable cap (consisting of existing building foundations and asphalt caps) would cover the ground surface and attach to all four slurry walls (slurry wall system).

Once constructed, the slurry wall system should effectively, laterally isolate contaminants from the remainder of the shallow water bearing zone, while the basal clay precludes downward contaminant migration. In addition to precluding solute transport, groundwater flow will be precluded from entering or exiting the slurry wall system. As an impermeable cap will prevent infiltration of precipitation, water levels within the slurry wall system should stagnate. However, given its impermeability, size and position, the slurry wall system could influence local hydraulic gradients and groundwater flow in the area.

Given the isolation of the slurry wall system, controlling water table elevations inside the system with pumping wells could have negative effects on the integrity of the slurry walls or structures in the area. Pumping will draw down water levels inside the slurry wall system, while water levels outside remain the same. Consequently, a differential in hydrostatic pressure will occur across the walls, potentially causing structural damage and leaks. Therefore, pumping should not be considered within the slurry wall system to actively dewater the area.

Shallow Water Bearing Zone

The shallow water bearing zone is comprised of from shallowest to deepest: artificial fill, an olive-gray silt, a fine sand, and then a massive clay unit that marks the base of the zone (Figures 2 and 3). All lithologic units are relatively continuous across the Site. Artificial fill used to reclaim low areas and fill wetlands is composed of sandy clay with occasional bricks and cinder ash. Fill materials range from 2 to 11 feet thick. Underlying the artificial fill, olive gray silt contains carbonaceous material including meadow mat. This silt unit ranges in thickness from 1 to 6 feet and is truncated in many places by the overlying fill.

Underlying the silt unit, a fine sand extends laterally from around B-10 to beneath Berry's Creek. The sand unit ranges in thickness from absent (0 feet) on the northwest portion of the Site around MW-10 to 13 feet thick below the Wolf Warehouse. Along Berry's Creek, the fine sand unit ranges around 8 feet thick. The fine sand is underlain by the thick deposits of glacio-lacustrine clay that form the base of the shallow water bearing zone and will provide an impermeable floor for the slurry wall system.

In total, as a hydraulic unit, the shallow water bearing zone reaches a maximum thickness of 17.5 feet from the average elevation of the water table to the top of the basal clay unit beneath the area of the Wolf Warehouse (Figure 2). On average, the unit ranges around 13 feet along the banks of Berry's Creek. The unit exhibits a minimum thickness of 9.5 feet around MW-10.

In the shallow water bearing zone, the sand unit exhibits the greatest hydraulic conductivity with values ranging up to 95 feet per day (ft/d) at MW-4. As the most permeable unit with relatively continuous extent between Berry's Creek and inland areas of the site, the sand unit serves as a conduit for groundwater flow and contaminant migration. The sand unit also conveys tidal fluctuations and saline water landward.

Groundwater flow in the shallow water bearing unit discharges to several, connected surface water bodies (Berry's Creek, Diamond Shamrock/Henkel (north) Ditch, West Ditch) that bound the southern and southeastern portion of the Site. The intended area of encapsulation forms a narrow neck between higher hydraulic gradients (0.0057 foot per foot; April 2000) on developed area to the northwest and more gentle gradients (0.00071 ft/ft; April 2000) in the undeveloped fill area to the southeast. Although gradients in the shallow water bearing zone are not strongly influenced by tidal action (Exponent, 2004) tidal fluctuations in Berry's Creek can range up to 6 feet (average 5.6 feet) per tidal cycle (0.52 days). Tidal fluctuations in the Diamond Shamrock/Henkel (north) and West Ditches are a function of the elevation of the bottom elevation of the ditches. In the West Ditch near Wolf Warehouse, water depths range around 1.75 feet at high tide, while the ditch is dry at low tide.

With the installation of an encapsulating slurry wall in the constricted area around Wolf Warehouse, hydraulic gradients and groundwater flow directions in the shallow water bearing zone could be modified in several ways. Cutting off flow from the northwest should result in reduced hydraulic gradients in the undeveloped fill area. Reduction in hydraulic gradients in the undeveloped fill area could result in increasing tidal fluctuations in the potentiometric surface of the shallow water bearing zone. Given a reduction in the hydraulic gradient in the wetlands area, saline water from Berry's Creek could encroach further into the shallow water bearing zone affecting deep-rooted plant species sensitive to changes in salinity. Furthermore, areas upgradient of the slurry wall system may be subject to mounding and flooding of water at the ground surface unless appropriate drainage measures are implemented.

Mathematical Modeling

Three analytical techniques were applied to evaluate the following potential changes in the potentiometric surface at the Site:

1. Inland tidal oscillations;
2. Encroachment of saltwater into shallow water bearing zone beneath the developed and undeveloped fill areas; and
3. Flooding of developed area.

One-dimensional analytical techniques were applied along Section Lines A-A' and B-B'. These transects were situated to evaluate changes caused by the slurry wall beneath both the developed and undeveloped fill areas of the Site. Section line A-A' transects the Site from MW-10 to MW-4 and was used to assess groundwater flow beneath the undeveloped fill area, and the transition between the undeveloped and developed fill areas. Section line B-B' extends from MW-13 across the developed area to the West Ditch.

Inland Tidal Oscillations

Because Berry's Creek and other drainage features in the area have eroded channels that transect the sandy unit in the shallow water bearing zone, these features intercept the horizontal flow of groundwater and form an outflow boundary that controls the water table elevation. Tidal fluctuations in Berry's Creek and the connected ditches would be propagated laterally into the fine sand unit of the shallow water bearing zone for a distance that varies depending on the tidal period, the amplitude of tidal fluctuations in the creek and the hydraulic diffusivity of the sand unit. Hydraulic diffusivity pertains to the ratio of aquifer transmissivity to the storage coefficient.

If propagated inland, tidal fluctuations could influence the water table in the slurry wall system. Leakage through the walls, or at the wall/floor interface with the basal clay, could result in water table fluctuations, and possibly flooding in the system. Conversely, in the absence of leakage, the hydraulic system within the slurry wall system should be effectively isolated from external hydraulic influences, precluding tidal influences.

Propagation of tidal oscillations in an aquifer inland from a tidal boundary was estimated using a method developed by Todd (1980) and others as follows:

$h(x,t) = h_o \exp\text{-}x[(piS/t_oT)^{0.5}]$ where:

$h(x, t)$= head in aquifer a set distance inland from coast line (feet)

h_o = Maximum tidal fluctuation in surface water body (feet)

-x = distance from shoreline (feet)

S = coefficient of storage (dimensionless- 0.1)

t_o = tidal period (days)

T = transmissivity (ft^2/d)

Pi= 3.14159

The method assumes that tidal oscillations can be represented as a sinusoidal function of time, and estimates potentiometric head fluctuations in an aquifer with distance from the tidal boundary. Assumptions applied with the use of this model include the following:

1. Transmissivity is the same throughout the aquifer.
2. Aquifer thickness (sand unit) is constant.
3. Tidal fluctuations are sufficiently small that transmissivity will not change in proportion to a change in aquifer thickness.

The tidal period for the analysis was 12.5 hours (0.52 days) coinciding with the period of a standard semi-diurnal tide. Tidal range was obtained from a tidal study performed in January 1998 (Exponent, 2004), that included measurements upgradient and downgradient of the tidal gate in Berry's Creek. For Section A-A', the transmissivity was taken from the average hydraulic conductivity value (95 ft/d) from slug tests at MW-4 multiplied by a unit thickness of 8 feet at the discharge face of the sand unit adjacent to Berry's Creek. A storage coefficient of 0.1 was assumed for the unconfined shallow water bearing zone (Walton, 1989).

After assessment of baseline tidal oscillations, 2 feet was added to the saturated thickness of the shallow water bearing zone to account for potential mounding in the shallow water bearing zone after construction of the slurry wall system. The addition of 2 feet approximates mounding of the water table from its present average depth to the ground surface. Following the adjustment of saturated thickness, tidal oscillations were estimated for the shallow water bearing zone after installation of the slurry wall system.

For Section Line B-B,' the tidal range from the January 1998 tidal study was adjusted for the base elevation of the West Ditch. The West Ditch is dry several times per day. Considering Berry's Creek fluctuates from -2.8 feet MSL to 2.8 feet MSL over a typical tidal cycle (5.6 feet), the tidal range in the West Ditch in the area of the Wolf Warehouse is 1.80 feet from the base of the ditch, at 1.0 feet MSL, to around 2.8 feet MSL. Similar to Section A-A', the transmissivity was based on hydraulic conductivity values from slug tests conducted in the monitoring well closest to the outflow face in the West Ditch (MW-9; 13 ft/d) multiplied by the thickness of the sand unit in this area (13 ft).

Results of the tidal oscillation analysis indicate that oscillations in the water table from tidal action should not be perceptible further than 100 feet from the tidal boundary in the sand unit on Section line A-A' and 150 feet along Section line B-B' (Table 1). These results are consistent with the absence of tidal oscillations observed in MW-1, 2, 4, 6, and 7 during the synoptic study performed in January 1998. Adjusting the transmissivity values along each section line to account for an increase in saturated thickness had minimal effect on the results.

TABLE 1

Estimated Increase in Tidal Oscillation

Distance from Tidal Boundary (feet)	Section Line A-A' (feet)	Section Line B-B' (feet)
10	0.648	0.721
50	0.115	0.195
100	0.013	0.038
150	0.002	0.007

Location of Saltwater Wedge in Shallow Water Bearing Zone

An evaluation of salt water encroachment into the shallow water bearing zone from Berry's Creek was conducted by running streamlines parallel to Section Lines A-A' and B-B' to Berry's Creek and the West Ditch, respectively. The purpose of this evaluation was to estimate the depth of the interface boundary between the saline and fresh groundwater, and the inland extent of the tip of the salt water wedge.

Hydraulic conditions along Section Lines A-A' and B-B' should change after construction of the slurry wall system. Along Section Line A-A', the hydraulic gradient should flatten as flow from the developed area is blocked and routed to the West Ditch. For this evaluation, a hydraulic gradient encompassing the entire length of Section Line A-A' was simulated to establish a baseline condition. After construction, a gradient for only the portion of Section Line A-A' downgradient of MW-7 was considered. Unlike post-construction conditions along Section Line A-A', the gradient toward the West Ditch along Section Line B-B' will potentially increase with mounding behind the slurry wall. For this evaluation, potentiometric levels in MW-9 were assumed to reach 3.9 feet MSL, roughly equal to the elevation of the ground surface.

The shape and position of the boundary at the freshwater/saltwater interface is a function of the volume of freshwater discharging from the aquifer. The general geometry of the boundary is concave landward with the denser saltwater lying below the freshwater along the basal confining bed of the unit. The lower portion of the boundary extends further landward than the upper portion, forming a wedge of saltwater beneath the freshwater.

Any action that changes the volume of freshwater discharge results in a consequent adjustment of the saltwater/freshwater boundary. Minor fluctuations in the boundary position occur with tidal actions with the seasonal and annual changes in the amount of freshwater discharge. Following construction, the volume of freshwater may be reduced as flow from the developed area to the northwest is blocked by the slurry wall system. Hydraulic gradients beneath the undeveloped fill area toward Berry's Creek should flatten, while gradients toward the West Ditch northwest of the slurry wall system should increase.

Mathematical modeling of the depth to the encroaching saltwater boundary was conducted using the "single potential" method developed by Strack (1989) as follows:

$Z = [(2qxG)/K]^{0.5}$

Z = depth (ft)

q = discharge at outflow face (KIA) per unit width [(ft^3/d)/ft] where I equals the hydraulic gradient in feet/foot (ft/ft), and A is area in ft^2.

x= horizontal distance along flowline (ft)

K= hydraulic conductivity (ft/d)

$G = P_f/P_s\text{-}P_f$

P_f = density of freshwater (1.0 gram per cubic centimeter)

P_s = density of saltwater (1.025 g/cc)

Strack modified the Ghyben-Herzberg method to account for thin aquifers and reasonably stable flow conditions. The method assumes that freshwater flows toward the saltwater interface and, therefore, is not appropriate for use in areas where heavy pumpage diverts groundwater from flowing toward the coast. Given the hydraulic conditions in the area around the Site, the single potential method should provide reasonable accuracy for this analysis.

The position of the saltwater wedge in the shallow water bearing zone was simulated at existing conditions, and then at expected conditions after installation of the slurry wall and cap around Wolf Warehouse. Along Section Line A-A', simulations were run at the existing gradient (0.00157 ft/ft), and at a reduced gradient (0.00071 ft/ft) when flow from the northwest is occluded by the slurry wall system. In Section B-B', the existing gradient toward the West Ditch is 0.0075 ft/ft. With installation of the slurry wall complex, the head around MW-9 was assumed to increase from around 3 feet MSL to 3.9 feet MSL, roughly at the ground surface, as groundwater mounds against the northwestern face of the complex. As a result the hydraulic gradient toward West Ditch increased to 0.0095 ft/ft.

Along Section A-A', the elevation of the saltwater interface increases from approximately -9.35 feet MSL to -5.51 feet MSL beneath the projected location of the slurry wall complex (Figure 4; Table 2). Saltwater inundates nearly the entire thickness of the sand unit. By comparison, along Section B-B', the elevation of the saltwater interface decreases from -11.9 to -13.9 feet MSL at the northeast end of the section line (Figure 5).

TABLE 2

Estimate of Change in Depth of Saltwater/Freshwater Wedge

Distance from Tidal Boundary (ft)	Difference in Depth from baseline condition	
	Section Line A-A'	Section Line B-B'
	(ft)	(ft)
50	0.75	-0.63
100	1.06	-0.89
200	1.50	-1.25
300	1.83	-1.54
400	2.12	-1.77
500	2.37	-1.98
600	2.59	NA
700	2.80	NA
800	3.00	NA
900	3.18	NA
1000	3.35	NA
1100	3.51	NA
1200	3.67	NA
1300	3.82	NA
1400	3.96	NA
1500	4.10	NA
1600	4.24	NA
1700	4.37	NA

NA-not applicable
Negative number indicates increase in depth of saltwater/freshwater interface

Flooding of Developed Area

In addition to modifying the position of a saline water wedge in the shallow water bearing zone, construction of the slurry wall system would modify water table elevations in the developed and undeveloped fill areas of the Site. As discussed previously, emplacement of the slurry wall will occlude natural groundwater flow between the developed and undeveloped fill areas of the Site. Without drainage-type engineering controls, groundwater would mound against the slurry wall raising the elevation of the water table. The area around the Wolf Warehouse already floods from surface water incursion during storms, unusually high tides, and groundwater elevations exceeding the ground surface. At some locations the water table is only 1 foot below grade.

Appendix B
Evaluation of Potentiometric Surface and Tidal Influence on Slurry Wall

Assuming a hydraulic conductivity of 13 ft/d, an average saturated thickness of 13 feet for the shallow water bearing zone, and a hydraulic gradient of 0.0057 ft/ft, approximately 3,000 gallons of water per day flows beneath a 400-foot wide zone extending northeast from the West Ditch to the property line. Upon construction of the slurry wall system, flow in the shallow water bearing zone would be blocked between the developed and undeveloped fill areas of the Site.

An analysis was conducted to evaluate the upgradient water table elevation if mounding at the northwest wall of the slurry wall system increases the water table 1.0 foot in elevation. The analysis was performed using a one-dimensional method for steady groundwater flow in unconfined aquifers with uniform recharge as developed from the Dupuit equation (Bear, 1979) as follows:

$H = [(H_1^2 - (H_1^2 - H_2^2)\ x/L) + (w/K(L\text{-}x)x)]^{\ 2}$

H = head above the base of aquifer at specific point along flowline

H_1 = Head at top of flowline

H_2 = Head at bottom of flowline (x = L)

X = distance from top of flowline

L = total distance along flowline

W = rate of aquifer recharge from infiltration of rain water (ft^3/d)

K = hydraulic conductivity of aquifer (ft/d)

This method was applied along the northwest end of Section Line A-A′ (Streamline A-A′; Figure 1) between MW-10 and the expected northwestern wall of the slurry wall complex at MW-9. Investigating the influence of a one foot increase in the water table elevation involved applying the calculations at varying distances along the section line. Given a average annual precipitation rate of 44 inches per year and assuming 10 percent of precipitation infiltrates the ground surface, the daily rate of recharge ranges around 0.001 ft^3/d.

The increase in the water table elevation dissipates with distance along Streamline A-A′ (Table 3). At 300 feet from the northwestern end of the slurry wall, the increase in elevation was around 0.33 feet. When comparing groundwater and ground surface elevations along Section Line A-A,′ a 1.0 foot increase in water table elevation is important. At many points along Streamline A-A′ up to 400 feet from the northwestern slurry wall, water table elevations would exceed the ground surface. Thus, without appropriate drainage measures the developed area could be flooded after construction of the slurry wall system.

TABLE 3

Estimated Water Table Rise from North Wall of Slurry Wall System

Distance from North Wall (ft)	Elevation (ft MSL)	Increase in Elevation (ft)	Ground Surface Elevation (ft MSL)	Water Above Ground Surface (ft)
0	4.21	1.00		
10	4.26	0.97		
20	4.31	0.93		
30	4.35	0.90		
40	4.40	0.87		
50	4.45	0.84	4.25	0.20
60	4.49	0.81		
70	4.54	0.79		
80	4.58	0.76		
90	4.63	0.73		
100	4.67	0.71	4.59	0.08
110	4.71	0.69		
120	4.76	0.66		
130	4.80	0.64		
140	4.84	0.62		
150	4.88	0.60	4.75	0.13
160	4.92	0.58		
170	4.97	0.56		
180	5.01	0.54		
190	5.05	0.52		
200	5.09	0.50	5.01	0.08
210	5.13	0.48		
220	5.17	0.46		
230	5.21	0.44		
240	5.24	0.43		
250	5.28	0.41	5.25	0.03
260	5.32	0.39		
270	5.36	0.38		
280	5.40	0.36		
290	5.44	0.35		
300	5.47	0.33	5.5	-0.03
310	5.51	0.32		
320	5.55	0.30		
330	5.58	0.29		
340	5.62	0.27		
350	5.66	0.26	5.61	0.05
360	5.69	0.25		
370	5.73	0.23		
380	5.76	0.22		

TABLE 3

Estimated Water Table Rise from North Wall of Slurry Wall System

Distance from North Wall (ft)	Elevation (ft MSL)	Increase in Elevation (ft)	Ground Surface Elevation (ft MSL)	Water Above Ground Surface (ft)	
390	5.80	0.21			
400	5.83	0.19	5.91	-0.08	
410	5.87	0.18			
420	5.90	0.17			
430	5.94	0.16			
440	5.97	0.14			
450	6.01	0.13	6.15	-0.14	
460	6.04	0.12			
470	6.07	0.11			
480	6.11	0.10			
490	6.14	0.09			
500	6.17	0.07	6.41	-0.24	
510	6.21	0.06			
520	6.24	0.05			
530	6.27	0.04			
540	6.30	0.03			
550	6.34	0.02	6.6	-0.26	
560	6.37	0.01			
570	6.40	0.00			

Conclusions

The following conclusions were developed from the evaluation of hydraulic conditions at the Site:

- Although hydraulic conditions within the slurry wall system will become essentially stagnant and the water table will not significantly increase or decrease with groundwater or tidal fluctuations, the system will influence conditions in the remainder of the shallow water bearing zone surrounding the slurry wall.
- Contaminated water contained in a slurry wall system located beneath the Wolf Warehouse would be isolated from flow conditions in the shallow water bearing zone.
- A thick, nearly impermeable clay unit at the base of the shallow water bearing zone will preclude downward vertical migration of contaminants below the slurry wall system. An impermeable cap would prevent infiltration of water from precipitation and surface run off into the slurry wall system.
- A change in hydraulic gradients from installation of the slurry wall system would have negligible effect on the propagation of tidal oscillations into the shallow water bearing zone. Conversely, even if significant leaks are present in the slurry wall system, tidal

oscillations would not propagate sufficiently inland to influence water table fluctuations in the slurry wall system.

- The change in hydraulic gradients in the undeveloped fill area of the site would accommodate additional encroachment of the saltwater wedge across the undeveloped fill area along Section A-A'. After installation of the slurry wall system, the elevation of the salt water/freshwater interface would increase from -9.35 to -5.51 feet MSL beneath the slurry wall system.
- Conversely, the elevation of the saltwater/freshwater interface would decrease beneath Section Line B-B' from -11.9 to -14.2 feet MSL.
- Evaluation of potential increases in the water table elevation in the developed area suggests than even with only a 1.0 foot increase from mounding on the northwestern edge of the slurry wall system, much of the developed area could be flooded.
- The implementation of any slurry wall system should include engineering controls to convey groundwater from north of the system to the West Ditch.

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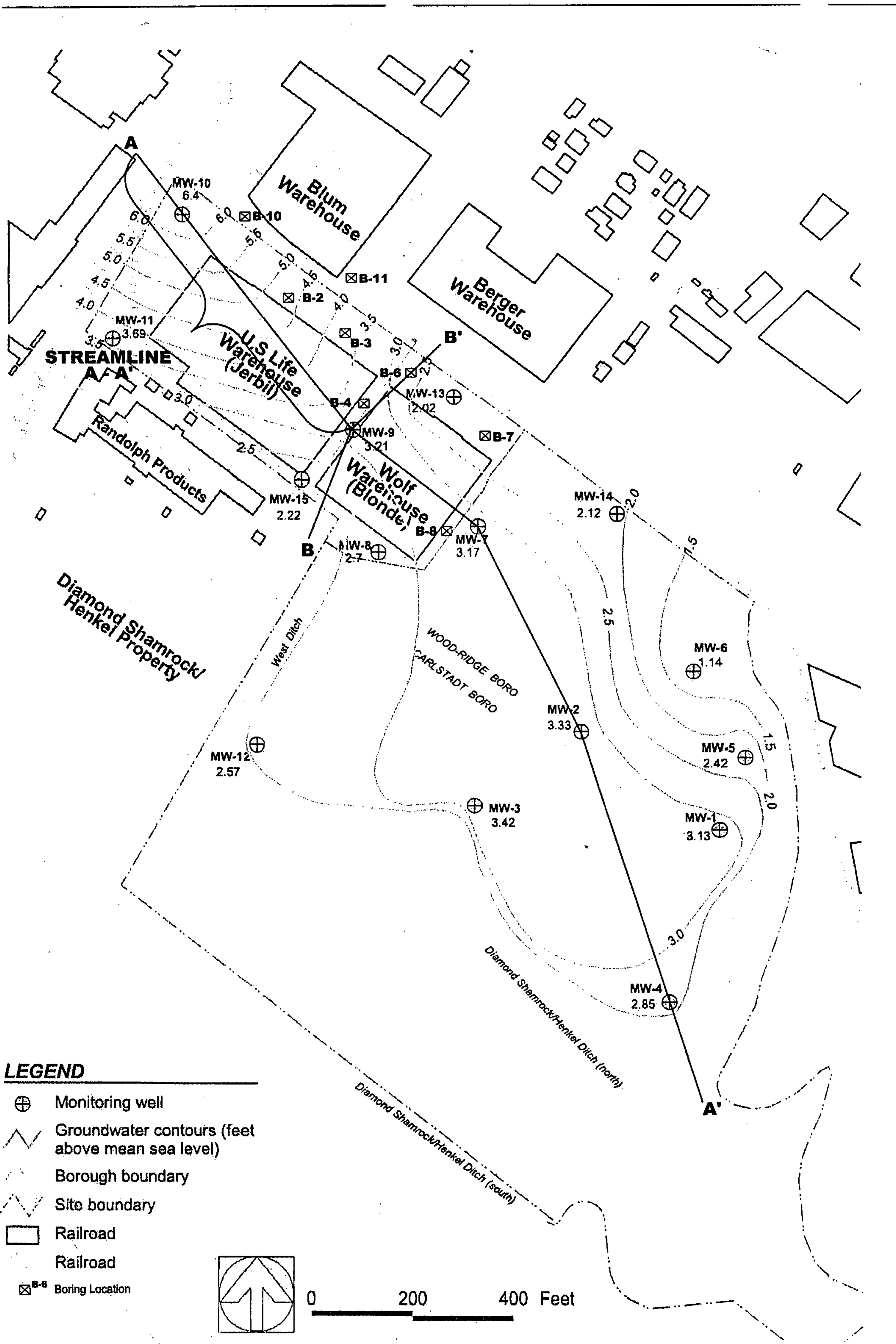


Source map survey by: James M. Stewart, Inc. and Exponent, 2004

Figure 1
SITE AND SECTION LINE MAP
Rohm and Haas Company
Wood-Ridge, New Jersey

CH2MHILL

0004f_321062.dgn

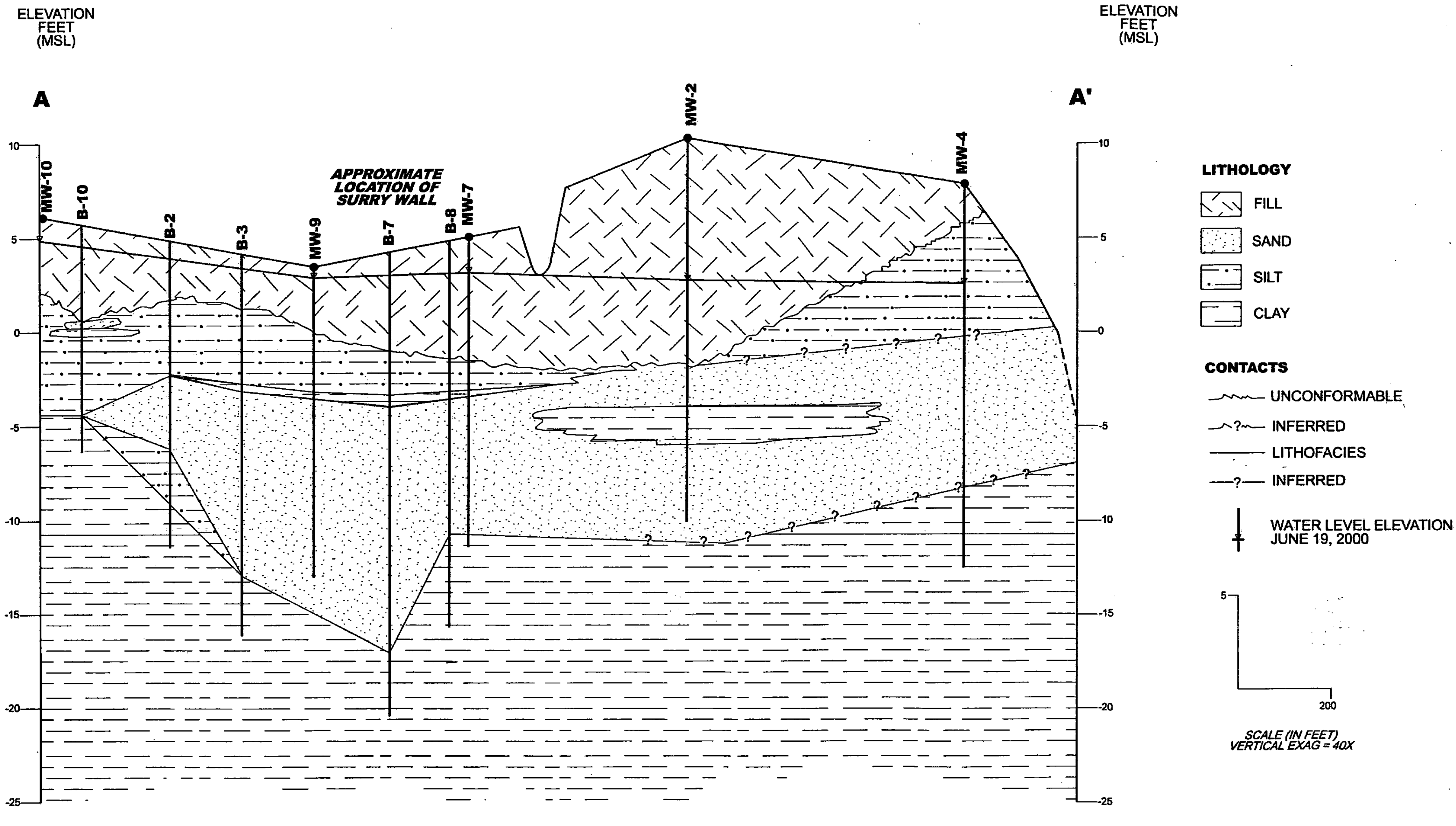
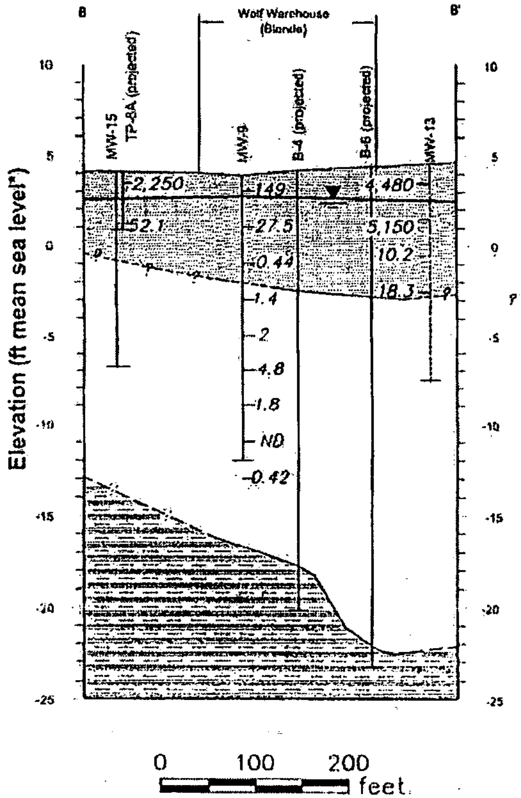


Figure 2
CROSS SECTION A - A'
Rohm and Haas Company
Wood-Ridge, New Jersey

CH2MHILL



Note: Vertical scale is exaggerated 20x

*Ward (1974, 1975) elevation data based on U.S. Coast and Geodetic Survey (U.S.C.&G.S.) datum, date unknown; unconfirmed correlation with Exponent and NJDEP elevation data based on National Geodetic Vertical Datum (NGVD) datum, 1988.

Source: Exponent 2004

LEGEND

- Engineered fill (located in developed area - silt and clay with minor sand and gravel, minor debris)
- Fill (located in undeveloped area - silt, sand and gravel with abundant miscellaneous debris)
- Organic rich silt and peat (with debris in landfill area)
- Fine to coarse sand
- Undifferentiated fine-grained deposits (silt and clay with thin layers of sand, including varved silt and clay as described by Ward (1974 and 1975))
- −0.5 Hg soil concentrations (mg/kg) from boreholes and test pits, shown at midpoint of sample composite interval
- ? Unknown or uncertain
- Unit contact; dashed where inferred; queried where uncertain (some unit contacts for undifferentiated fine grained deposits based on top of clay layer interpretation on Figure N-10)
- Well casing interval
- Well screen interval
- Borehole or test pit interval
- Groundwater elevation (approximate) December 1999

Figure 3

CROSS SECTION B - B'

Rohm and Haas Company
Wood-Ridge, New Jersey

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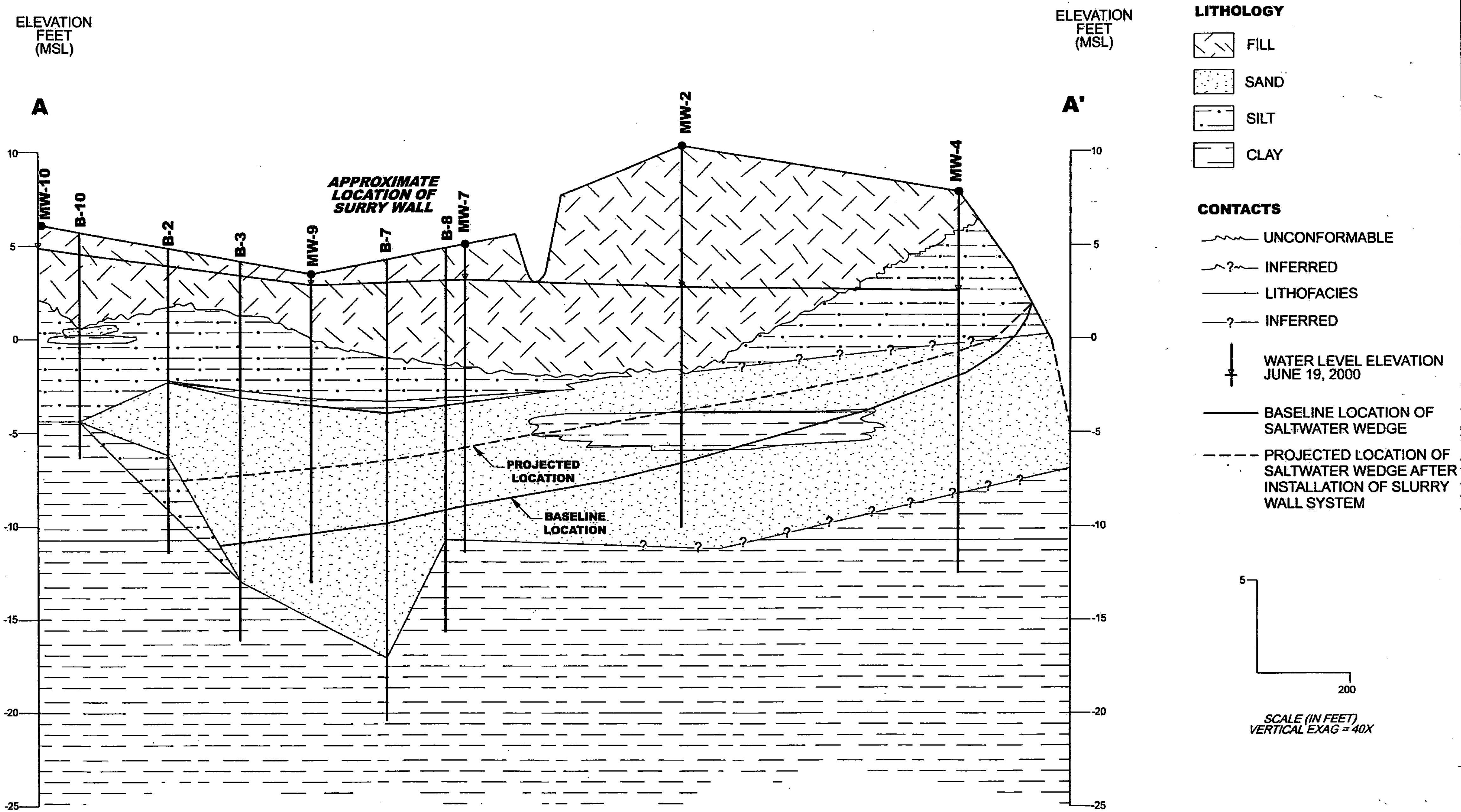

Figure 4
ESTIMATE OF BASELINE AND PROJECTED LOCATION OF SALTWATER WEDGE AFTER INSTALLATION OF SLURRY WALL SYSTEM CROSS SECTION A - A'

Rohm and Haas Company
Wood-Ridge, New Jersey

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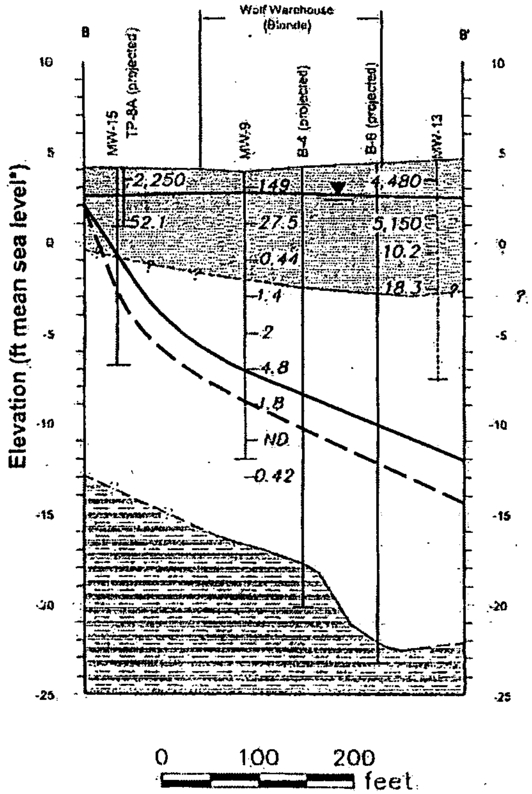

Note: Vertical scale is exaggerated 20x

*Ward (1974, 1975) elevation data based on U.S. Coast and Geodetic Survey (U.S.C.&G.S.) datum, date unknown; unconfirmed correlation with Exponent and NJDEP elevation data based on National Geodetic Vertical Datum (NGVD) datum, 1988.

BASELINE LOCATION OF SALTWATER WEDGE

PROJECTED LOCATION OF SALTWATER WEDGE

LEGEND

- Engineered fill (located in developed area - silt and clay with minor sand and gravel, minor debris)
- Fill (located in undeveloped area - silt, sand and gravel with abundant miscellaneous debris)
- Organic rich silt and peat (with debris in landfill area)
- Fine to coarse sand
- Undifferentiated fine-grained deposits (silt and clay with thin layers of sand, including varved silt and clay as described by Ward (1974 and 1975))
- −0.5 Hg soil concentrations (mg/kg) from boreholes and test pits, shown at midpoint of sample composite interval
- ? Unknown or uncertain
- Unit contact; dashed where inferred; queried where uncertain (some unit contacts for undifferentiated fine grained deposits based on top of clay layer intrepretation on Figure N-10)
- Well casing interval
- Well screen interval
- Borehole or test pit interval
- Groundwater elevation (approximate) December 1999

Source: Exponent 2004

Figure 5

ESTIMATE OF BASELINE AND PROJECTED LOCATIONS OF SALTWATER WEDGE AFTER INSTALLATION OF SLURRY WALL SYSTEM CROSS SECTION B -B'

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